The Influence of Slope, Initial Water Content and Compaction Soil on Runoff and Infiltration for Urban Drainage

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INTRODUCTION

1. The hydrological processes in the urban drainage are rainfall, runoff, and infiltration. This phenomenon of water balance occurs to be the concept of urban drainage.
2. Hydrological problems cannot be solved just by linking two variables or see the influence of one variable against another variable, so this research aims to find out how the relationship soil density, initial moisture content, and slope of land can influence together in the event of rain, runoff and infiltration.
3. The objective of research is to understand the effect of soil compaction factor on water absorption at urban drainage land if considering simultaneous effect soil treatment, slope and initial water content on soil compaction factor.

MATERIALS AND METHODS

1. Experimental setup

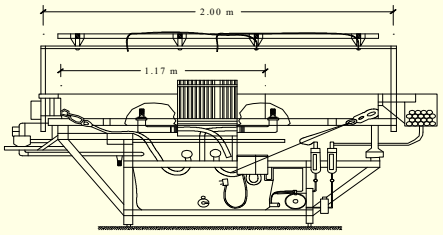
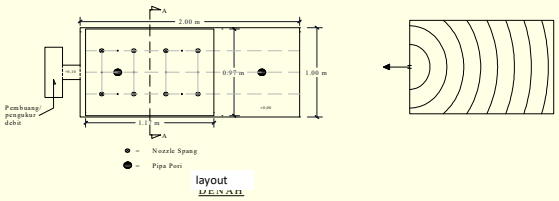


Fig.1 Experimental setup for Rainfall and Runoff Process

Infiltration is observed during runoff. Rainfall volume influential to infiltration is observed by examining the rates of water incoming to and runoff from the retention region.



2. The relationship between infiltration rate and runoff that is often seen during artificial rainfall at fixed intensity. The capacity of soil infiltration is the biggest at early rain but it declines with the prolonged rain until it reaches minimum constant.

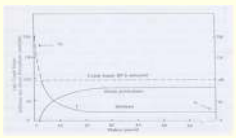


Fig 2. The curve of the relationship between infiltration rate and runoff in the artificial rainfal at fixed intensity.

Infiltration rate (f) is measured by the unit of centimeter/hour or mili-meter per hour. If water is inundated in the case overland flow, the occurred infiltration is potential infiltration. If water supply on soil surface is smaller than potential infiltration, then actual infiltration is smaller than potential infiltration.

RESULTS AND DISCUSSION

1. Infiltration and Runoff Process

Infiltration and runoff occurrences from the relationship between rainfall, runoff and infiltration under laboratory experiment can be described as follows:

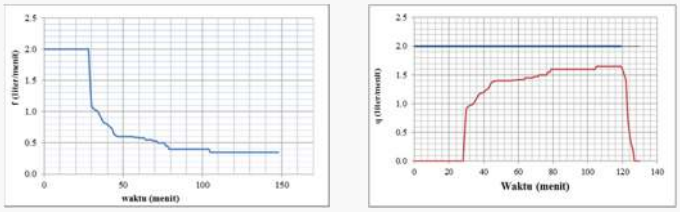


Figure 3. Infiltration and Runoff Process

2. The Result of Runoff Observation

The following is the result of observation on runoff discharge starting from less-saturated to saturated conditions, while rain is stopped at certain time per minute.

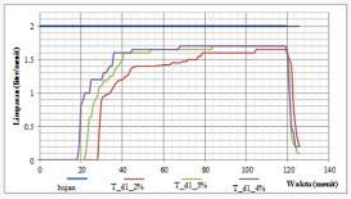


Fig. 4. The Curves of runoff at the compaction of 2 periods (d1) and the slopes of 2,3,4%

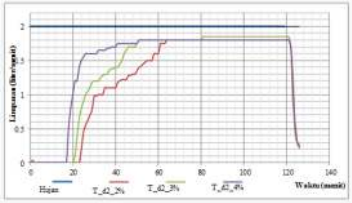


Fig. 5. The Curves of runoff at the compaction of 4 periods and the slopes of 2, 3, and 4%.

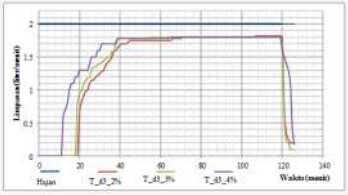


Fig. 6. The Curves of runoff at the compaction of 6 periods and the slopes of 2, 3, and 4%.

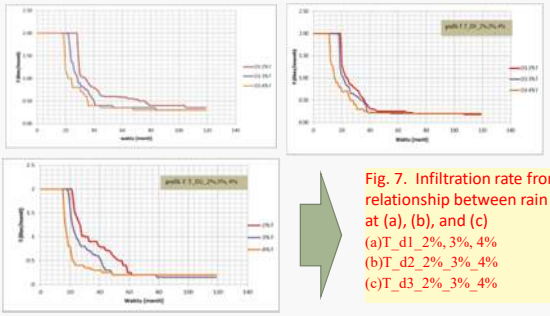


Fig. 7. Infiltration rate from the relationship between rain and runoff at (a), (b), and (c)
(a)T_d1_2%, 3%, 4%
(b)T_d2_2%_3%_4%
(c)T_d3_2%_3%_4%

CONCLUSIONS

1. Various compactions at d1, d2, and d3 influence infiltration rate. Greater compaction of the soil causes water in the tank to runoff faster. Water absorbed is quite few. At various slopes but still in similar compaction, runoff becomes faster with the greater slope height. Runoff rate of each treatment is approximated to each other. Initial water content influences infiltration rate by affecting the process of the filling into soil pores.
2. At similar compaction and higher slope, infiltration rate is smaller when the flow is constant. At similar slope and higher compaction, infiltration rate is also smaller when the flow is constant.
3. Based on the concept of the relationship between rainfall and runoff in water balance concept of *kinematical wave law*, then time for concentration is read during runoff occurrence.